

AN UNUSUAL INDO-WEST PACIFIC CARDINALFISH
OF THE GENUS *APOGON*
(TELEOSTEI: APOGONIDAE)

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Abstract.—A deep dwelling cardinalfish, *Apogon gularis*, with an unusually positioned anus is described as new from the Red Sea, Indian Ocean, and the Philippine Islands. *Apogon gularis* appears most similar to *A. atrogaster* in body shape and gillraker count but differs from that species in having six first dorsal fin spines, anus near the anal fin, and different color pattern. The presence of two basic types of a forward positioned anus in seven orders in other fishes is discussed.

The known anatomical diversity of the cardinalfish family Apogonidae is expanded by the description of this unusual deep dwelling species. The advanced position of the anus, tubercle-like organs on the scales, and whitish zone encircling the black tissue around the anal aperture are characteristics of prime interest. Based on our present knowledge the first two characteristics are unique to this species in the family. Nevertheless, other anatomical data do not support generic recognition.

Methods

All measurements were made with dial calipers. Gillraker counts include all rudiments. The raker at the angle of the arch is included in the lower arch count. The last dorsal and anal rays are a composite of two elements divided to the base; in each case they were counted as one. Measurements follow the methods presented in Schultz et al. (1953:xxii), except that the body depth was taken from the dorsal-fin origin to the pelvic fin base. Cleared and stained material was prepared and radiographs of selected material were examined for skeletal comparisons with other Apogonidae.

Type material out of USNM 225678 (National Museum of Natural History) is deposited in the following institutions: Academy of Natural Sciences, Philadelphia; Australian Museum, Sydney; Bernice P. Bishop Museum, Honolulu; California Academy of Sciences, San Francisco; Museum National d'Histoire Naturelle, Paris; British Museum (Natural History), London; Rhodes University, J. L. B. Smith Institute of Ichthyology, Grahamstown, South Africa.

Apogon gularis, new species
Figs. 1-2

Material examined.—Holotype: USNM 225672 (36.1 mm SL), Red Sea, 14°55'N, 42°28'E, 13 Jun 1958, R/V ATLANTIS.

Paratypes: USNM 225673, 8 (25.0-29.1), data same as for holotype. Indian Ocean: USNM 225674, 6 (43.2-48.2), 26°35'N, 52°25'E, 73 m, 1 Dec 1963, sta 259A, cruise 4B, R/V Anton Bruun. USNM 225676, 20 (38.2-54.7), 9°54'N,



Fig. 1. *Apogon gularis*, new species, USNM 225672, holotype, 36.1 mm SL, from the Red Sea.

97°42'E, 24 Mar 1963, sta 21, cruise 1, R/V Anton Bruun. USNM 225678, 146 (34.4–57.3), 10°39'N, 97°06'E, 290 m, 24 Mar 1963, sta 22A, cruise 1, R/V Anton Bruun. USNM 225677, 1 (50.5), 10°37'N, 97°34'E, 96 m, 24 Mar 1963, sta 22, cruise 1, R/V Anton Bruun. USNM 203774, 26 (28.7–47.5), 14°07'N, 97°05'E, 30 Mar 1963, sta 38, cruise 1, R/V Anton Bruun (2 specimens cleared and stained). USNM 225679, 31 (35.0–51.5), 13°28'N, 97°19'E, 30 Mar 1963, sta 37, cruise 1, R/V Anton Bruun. USNM 225675, 4 (31.6–36.7), 15°08'N, 94°04'E, 1 Apr 1963, sta 43, cruise 1, R/V Anton Bruun. West Pacific Ocean: USNM 225680, 1 (54.1), Philippine Is., Viscayan Sea, 11°28'42"N, 123°28'42"E, 69.5 m, 5 Jun 1978, "Sting Ray," sta T-4.

Material of other species examined.—*Apogon atrogaster* (Smith and Radcliffe, 1912). Holotype, USNM 70249 (46.8). Paratypes, USNM 163227, 7 (35.0–47.5), Philippine Is., Western Luzon, 16°30'N, 120°11'E, 11 May 1909, 83 m.

Diagnosis.—Anus shifted forward, located just behind the pelvic-fins' origins; urogenital opening in normal position; 6 first dorsal-fin spines; developed gill-rakers 20–24; 0–3 rudiments; 4–5 rakers on upper arch; 16–19 rakers, 0–2 rudiments on lower arch; total gillrakers 23–26.

Description.—For general body shape see Fig. 1. Range of proportions (as percentages of standard lengths): greatest body depth 32.3–34.5; head length 39.2–42.9; eye length 10.0–11.6; snout length 8.9–9.6; bony interorbital width 8.6–9.4; upper jaw length 16.5–18.6; caudal peduncle depth 14.0–15.3; caudal peduncle length 24.7–29.2; first dorsal-fin spine length 10.0–12.0; second dorsal-fin spine length 14.8–17.2; third dorsal-fin spine length 14.7–16.0; fourth dorsal-fin spine length 11.7–13.4; first anal-fin spine length 2.0–2.7; second anal-fin spine length 11.6–12.8; pectoral fin length 23.4–25.5; pelvic fin length 17.8–21.2.

Dorsal fin VI-I,9; anal fin II,8; pectoral fin usually 14-14, rarely 15-14; pelvic fin I,5; principal caudal rays 9 + 8; pored lateral line scales 25; transverse scale rows above lateral line 2; transverse scale rows below lateral line 6; median predorsal scales 5; circumpeduncular scale rows 12–13 (5 + 2 + 5 or 6). The frequency of certain counts is given in Table 1.

Villiform teeth in several rows on the premaxilla; two rows on the dentary; one row on the palatine and vomer; none on ectopterygoid, entopteygoid or basihyal.

Vertebrae 10 + 14. Five free hypurals, one pair of slender uroneurals, three epurals, a free parhypural. Three predorsals, one spine on first dorsal pterygiophore. Basisphenoid present. Supramaxilla absent. Posttemporal serrate on posterior margin. Preopercle serrate on vertical and horizontal margins. Infraorbital shelf present on third bone.

Scales ctenoid, except cycloid below and in front of pectoral fin base and on pelvic fin base. Some individuals have tubercle-like organs on the scales, median pelvic scales, some pelvic fin rays, around the genital papilla, on scales above and below the pectoral fin base and on dorsal-fin rays.

Life colors unknown. In 70% ethanol three closely spaced lines of pigmentation on body extend from just behind opercle posteriorly about length of pectoral fin; snout with horizontal bar extending onto tip of lower jaw; fin membranes behind the second and third spines of first dorsal fin black distally; spots from cheek extend onto opercle in a diagonal fashion. Body otherwise uniformly pale. Stomach and intestine black, anus surrounded by a whitish zone indicative of possible luminous tissue.

Distribution.—Apparently a deep dwelling species, our collections from about 60–290 meters. *Apogon gularis* is known from the Red Sea, Western and Eastern Indian Ocean and the Philippine Islands.

Etymology.—The specific name is adapted from the Latin word *gula*, meaning throat or gullet, used in reference to the position of the anus which approaches the thoracic region.

Remarks.—*Apogon gularis* is unique among all apogonines in having the anus located just behind the pelvic fins' origins. Only *Cheilodipterus nigrotaeniatus* Smith and Radcliffe, and *C. zonatus* Smith and Radcliffe have the anus closer to the pelvic fin base than the anal fin (Radcliffe 1912).

A brief review of other fishes with forward displaced anal openings reveals two basic types in seven Orders: (1) those with both the anus and urogenital openings in the forward position, for example, *Acropoma* (Acropomatidae, Perciformes), *Aphredoderus* (Aphredoderidae, Percopsiformes), *Paratrachichthys* (Trachichthyidae, Beryciformes), *Prosoproctus* (Aploactinidae, Scorpaeniformes), in various gymnotoids (Cypriniformes) and phallostethids (Atheriniformes), (2) those with only a displaced anal opening, the urogenital opening in the typical position just in front of the anal fin, for example, *Steindachneria* (Macrouridae, Gadiformes) and *Apogon gularis* (Perciformes).

Most taxa that have this unusual anal position have generally been accorded generic status. Such taxa, however, have other characteristics that support such treatment. *Apogon gularis* alternatively can be clearly distinguished from other *Apogon* only on the basis of the advanced anal opening. All other characteristics indicate that it is a member of the large subgenus *Nectamia* as defined by Fraser (1972). The only species of *Apogon* that has a similar body shape and has similar gillraker counts is *Apogon atrogaster* (Smith and Radcliffe), in Radcliffe (1912). It has seven first dorsal spines, apparently different color patterns and does not appear to have a forward-positioned anus. The specimens are in poor condition probably as a result of being collected at 83 m by a beam trawl.

Examination of the holotype and paratypes of *A. atrogaster* lead us to believe that there are at least two species represented. The dorsal spines are damaged on the holotype and several paratypes so that we cannot tell if there were seven first

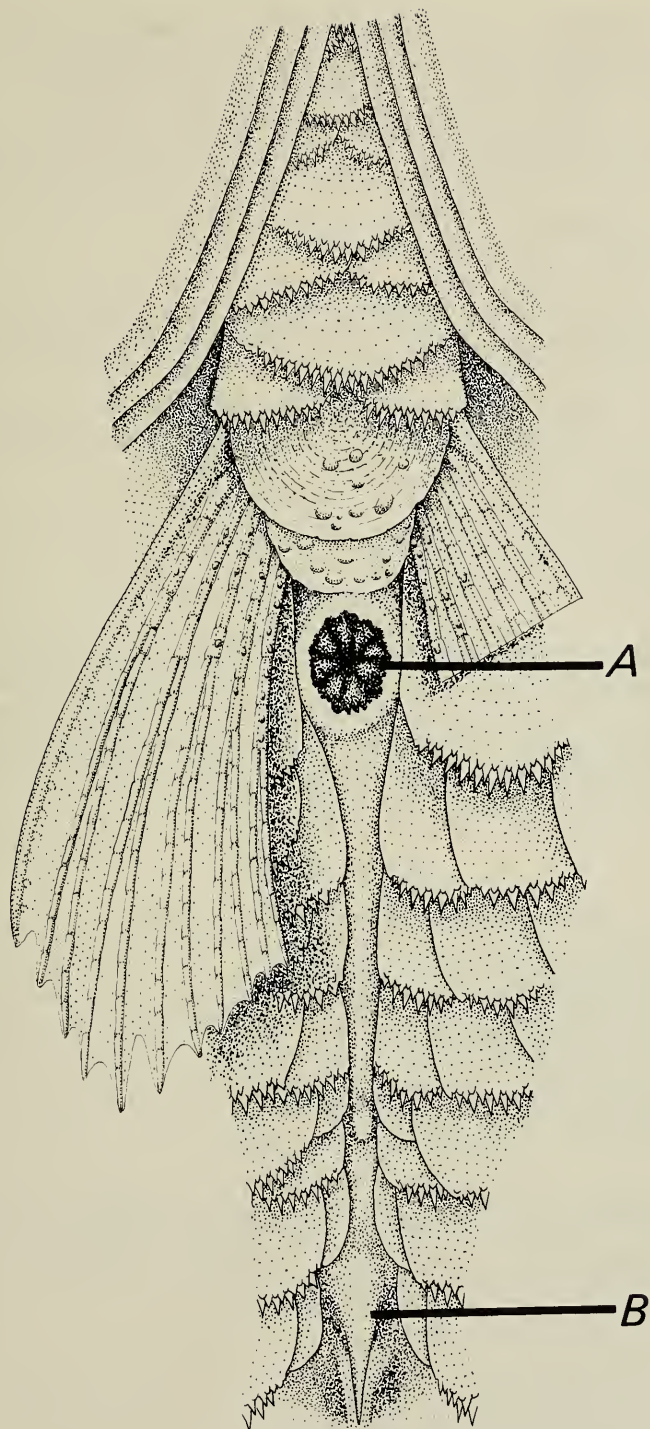


Fig. 2. Ventral view of *Apogon gularis* showing forward position of anus (a) near pelvic fin base. Specimen now cleared and stained, a paratype, out of USNM 225673. The urogenital papilla (b) is shown about 2 scale rows anterior to base of first spine of anal fin.

dorsal fin spines. The description and illustration of the holotype indicate seven. Two paratypes have seven dorsal spines but one has a gillraker count (2 + 3; 13 + 2) which is much lower than the holotype, and we believe it a different species, possibly *A. apogonides* (Bleeker). Our concept of *A. atrogaster* is a seven-spined species with a total gillraker count of 26–27 and an anal opening close to the anal fin origin. This includes only the holotype and largest paratype (47.5 mm). All other type material with six first dorsal spines but with the fin damaged cannot be identified with certainty by us.

Apogon gularis has some superficial similarities with species of the subgenus *Rhabdamia* (Fraser, 1972:28) in body shape and color pattern in preservation. However, a number of anatomical differences were mentioned by Fraser (1972: 21, 28).

Tubercle-like organs occur on the large pelvic scales and on the ventral side of the pelvic fin rays as shown in Fig. 2. Close examination of other specimens revealed the presence of the organs also around the genital papilla, on scales above the pectoral fin, on scales between the pectoral and pelvic fins and on the dorsal fins. These structures have not been reported to our knowledge in cardinalfishes.

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